mountain crest and begins to descend, the air is warmed by compression at the same rate as before. The cloud is soon evaporated and the air becomes clear, but as it continues to descend it is frequently much warmer than it was at the same level on the windward side. Doubtless heat is lost by radiation during the descent, but it is also being lost during the ascent, so that, as a general rule, the descending winds on the leeward side must be warmer and drier than the ascending winds on the windward side in proportion to the amount of moisture lost and latent heat retained, and also in proportion to the excess of gain by insolation over loss by radiation.

These descending warm winds are usually called "chinook winds" in the Rocky and Cascade mountains, while in the Alps they are called Foehn winds. Mr. Blandford says:

> These warm winds * * * always come from the direction of the mountains. In Montana the chinook is a westerly wind, while in Idaho it comes from any direction except west. At Boise it comes from the east.
>
> We should assign the mildness of the climate of southwestern Idaho to local causes rather than to a supposed current in the Pacific a thousand miles to the westward.

FLOW OF SPRING WATER AFTER FIRST KILLING FROST.

Mr. Woodruff Ball, of Nebraska, has submitted to Mr. H. McP. Baldwin, Assistant Observer in charge of the Weather Bureau station at Valentine, Nebr., some interesting observations, which are corroborated by the testimony of a number of other persons, about as follows:

Natural springs of water in the region where Mr. Ball lives, about fifty miles south of Valentine, are observed to rise or increase their volume about the time of the first killing frost, which is about the 15th of September. The flow continues through fall, winter, and spring. The springs generally begin to show a perceptible decrease about the first of June. It is not known how far below the soil the springs originate, but the rise in the well water is noticeable.

Any explanation of the above phenomenon must involve geological considerations, combined with the time and quantity of rainfall. We shall be glad if those who are familiar with the geological structure underlying Nebraska would elucidate this matter for the benefit of the readers of the WEATHER REVIEW.

AN OLD DESCRIPTION OF AMERICAN CLIMATES.

Our attention has recently been called to a description of the climate of different sections of the eastern part of the United States in Carey's American Pocket Atlas, published in Philadelphia in 1796, from which the following extracts have been obtained, and these apply as well to the present time as they do to the eighteenth century:

Page 13. New England; climate and diseases.—New England has a very healthful climate. It is estimated that one in seven of the inhabitants live to the age of 70 years, and one in thirteen or fourteen to 80 years and upward.

Winter commonly commences in its severity about the middle of December; sometimes earlier, and sometimes not till Christmas. Cattle are fed or housed in the northern parts of New England from about the 20th of November to the 20th of May; in the southern parts not quite so long.

Pages 45-46.—The Second Grand Division of the United States comprehends: New York, New Jersey, Pennsylvania, Delaware, and the Territory northwest of Ohio. It is bounded north by upper Canada, from which it is separated by the lakes; east by the New England States; south by the Atlantic Ocean, Maryland, Virginia, and the Ohio River, which separates it from Kentucky; west by the Mississippi River.

* * * * * * *

Climate.—The climate of this Grand Division, lying almost in the same latitudes, varies but little from that of New England. There are no two successive years alike. Even the same successive seasons and months differ from each other every year. And there is perhaps but one steady trait in the character of this climate, and that is, it is uniformly variable. The changes of weather are great and frequently sudden.[1]

There are seldom more than four months in the year in which the weather is agreeable without a fire. In winter the winds generally come from the northwest in fair and from the northeast in wet weather. The northwest winds are uncommonly dry as well as cold. The climate on the west side of the Allegheny Mountains differs materially from that on the east side, in the temperature of the air, and the effects of the wind upon the weather, and in the quantity of rain and snow which falls every year. The southwest winds on the west side of the mountains are accompanied by cold and rain. The temperature of the air is seldom so cold or so hot, by several degrees, as on the east side of the mountains.

On the whole, it appears that the climate of this division of the United States is a compound of most of the climates in the world; it has the moisture of Ireland in the spring; the heat of Africa in summer; the temperature of Italy in June; the sky of Egypt in autumn; the snow and cold of Norway, and the ice of Holland, in winter; the tempests (in a certain degree) of the West Indies in every season, and the variable winds and weather of Great Britain in every month of the year.

From this account of the climate of this district it is easy to ascertain what degree of health and what diseases prevail. As the inhabitants have the climates, so they have the acute diseases of all the countries that have been mentioned. Although it might be supposed that with such changes and varieties in the weather there would be contracted epidemical diseases and an unwholesome climate, yet on the whole, it is found in this district to be as healthy as any part of the United States.

Page 91. Maryland.—Here are also large tracts of marsh, which during the day load the atmosphere with vapor that falls in dew in the close of the summer and fall seasons, which are sickly. The spring and summer are mostly healthy.

Page 96. Virginia; climate.—It is remarkable that, proceeding on the same parallel of latitude westerly, the climate becomes colder in like manner as when we proceeded northward. This continues to be the case till we attain the summit of the Alleghenies, which is the highest between the sea and the Mississippi. From thence, descending in the same latitude to the Mississippi, the change reverses, and it becomes warmer there than it is in the same latitude on the sea side.

Page 100. Kentucky; climate.—Healthy and delightful, some few places in the neighborhood of ponds and low ground excepted. The inhabitants do not experience the extremes of heat and cold. Snow seldom falls deep or lays long. The winter, which begins at Christmas, is never longer than three months, and it is commonly but two, and is so mild that cattle can subsist without fodder.

Page 107. Tennessee; climate.—Temperate and healthy. In the tract lying between the Great Island, as it is called, and the Kanawha, the summers are remarkably cool and the air rather moist. Southwest of this, as far as the Indian towns, the climate is much warmer, and the soil better adapted to the products of the Southern States.

ON LIGHTNING RODS.

Mr. Henry P. Curtis, of Boston, writes to the Editor on the efficacy of lightning rods. He mentions several large hotels, scientifically protected by lightning conductors, that remained unscathed in a region of violent thunderstorms where he, at the same time, personally witnessed the destruction of unprotected buildings. One landlord said:

> He could charge a Leyden jar by holding it close to the foot of one of the conductors in a thunderstorm.

Mr. Curtis describes his experience during a thunderstorm at a mountain hotel in New York. He was standing on the piazza when—

> The most tremendous shock or concussion conceivable took place. I had a sudden sun dazzle in the eyes, a bitter taste in the mouth, a violent singing in the ears, a pungent sulphurous odor in the nose, and a severe headache. Then I learned that the house had been struck by lightning, that is to say, that the conductors had functioned effectively and had safely conducted the electricity into the lake, instead of the discharge falling upon the hotel and wrecking it.

FOREST FIRES IN NOVEMBER, 1819.

We are indebted to Mr. Albert Matthews for the following extracts from the old files of a Boston paper, the Columbian Centinel, relative to the forest fires of November, 1819.

From the Columbian Centinel, Wednesday, November 24, 1819, No. 3717, pp. 2-3:

> The late smoky atmosphere was experienced at nearly the same time far at sea, in the Canadas, and in the Eastern, Western, and Southern States, attended with colored rain. At sea the mariners found it difficult to take observations. The appearance was the most *murky* in Canada, where a general dread appears to have prevailed; and it is reported that many of the inhabitants of Montreal, in expectation that the darkness was a forerunner of an earthquake which would engulph their city, actu-

[1] See Monthly Weather Review for January, 1902. Vol. XXX, p. 19, note 2. Carey evidently took this sentence from Dr. Rush's article.—ED.

ally left it and fled to the neighboring towns. The Montreal papers contain whole columns of accounts of the "astonishing appearances," and it was conjectured that they were occasioned by eruptions of some neighboring volcano, and it was assured that during the darkness there were three shocks of an earthquake.

Smoky atmosphere.—Letters from Louisville, Ky., inform us that a great part of the woods between that place and Lexington, a distance of 74 miles, were in a blaze; and at Louisville the inhabitants had been nearly suffocated with smoke. * * * In North Carolina the smoky atmosphere was attributed to woods on fire in that State. The same in Canada.

From the Columbian Centinel of Wednesday, December 8, 1819, No. 3721, pp. 1, 3.

SOUTH CAROLINA, CHARLESTON, *November 25.*

Smoky atmosphere.—We have Bermuda papers of the 6th instant. They complain much of the smoky appearance and scent of their atmosphere, which some conjectured to have been occasioned by a great fire on the American Continent; and others, to be exhalations of the Gulph Stream.

PLANT LIFE AND RAINFALL.

The vegetation indigenous to any region having long since adapted itself to the climate of that locality, it follows that the occasional extremes of temperature, rainfall, drought, etc., that are injurious to indigenous vegetation must have some relation to the ability of the plant to adapt itself to the normal climate and its normal variability.

Thus, fifty-four years at San Francisco give an average annual rainfall of 22.74 inches; forty-one years at Salt Lake City give 17.47 inches; thirty years at Denver give 14.07 inches. The corresponding annual variability or the probable variation of any year from the mean is ±4.00, 4.50, and 5.00 inches, respectively. This probable variation indicates that the annual values vary so much that there is an even chance that any year at San Francisco will have a rainfall either between 26.74 and 18.74 inches, or beyond these limits. For Salt Lake City these figures become 21.97 and 12.97 inches; for Denver the figures are 9.07 and 19.07 inches. Of course, therefore, at San Francisco 18.83 inches would correspond to a dry year, but not necessarily to a drought destructive to indigenous plants, because delicate plants must long since have died out or have learned to adapt themselves to such average dry years, and a really destructive drought must be something still more severe. During the fifty-four calendar years of San Francisco records, there has been one year with the rainfall 11.37 inches, or 50 per cent of the average, and the general distribution of rainfall is shown in the following table:

TABLE 1.—*Precipitation by calendar years.*

Percentage of normal.	Precipitation, in inches.	Number of years.	
Wet years, above 100 per cent.	Over 22.74	22	
Dry years.... 100–90 per cent.	22.74–20.47	13	32
90–80 per cent.	20.47–18.19	7	
80–70 per cent.	18.19–15.92	5	
70–60 per cent.	15.92–13.65	5	
60–50 per cent.	13.65–11.37	1	
50– 0 per cent.	11.27– 0	1	
		54	

If we consider the valuable crop plants that have been introduced into California and whose prosperity depends upon the winter rainfall, namely, October to April, inclusive, then we must sum up the rainfall for the crop year, July–June, inclusive, rather than for the calendar year, January–December. Tables of this kind, given by Professor McAdie, show that the average annual rainfall is 22.74 inches, the same as before, but the frequency of dry years occurs as in Table 2.

Therefore, there have altogether been fewer dry seasons. Yet these show a greater number of severe droughts than are shown by the calendar years.

We must now further distinguish between a meteorological or climatological drought and an agricultural drought. Thus, Professor McAdie states that the year 1885, with a rainfall of 24.90 inches in the calendar year, but of 18.10 inches in the crop year, 1884–85, was an agricultural drought and that the wheat yield was the lowest in twenty years. Again, the year July, 1881–June, 1882, gave a seasonal rainfall of 16.14 and the next year July, 1882–June, 1883, gave a rainfall of 20.12 inches, and yet these were good wheat years. The moisture in the soil, the irrigation, and the area covered by wheat, is not ordinarily considered by the climatologist. He confines his studies to precipitation data, and speaks of dry and wet years without reference to agricultural statistics.

TABLE 2.—*Precipitation by crop years.*

Percentage of normal.	Precipitation, in inches.	Number of years.	
Wet years, above 100 per cent.		26	
Dry years.... 100–90 per cent	22.74–20.47	7	28
90–80 per cent.	20.47–18.19	9	
80–70 per cent.	18.19–15.92	6	
70–60 per cent.	15.92–13.65	1	
60–50 per cent.	13.65–11.37	1	
50– 0 per cent.	11.37– 0	4	
		54	

OCEAN WAVE AT HONOLULU, HAWAII.

Rev. Dr. Sereno E. Bishop, well known as the first observer of Bishop's circle, writes from Honolulu under date of December 4, 1903:

On November 29 the self-recording tide gage in this harbor recorded several high and low tides in succession only a few minutes apart.

These are ocean waves, believed to be due to earthquakes, and to have traveled several thousand miles across the Pacific. Similar waves are known in former times to have come from Peru, from Japan, and from Krakatoa. The direction of the source of these last waves is determined by the fact that there were slightly damaging inundations along the north shore of the island of Oahu and also along the north shore of Molokai on the same day. Dr. Bishop therefore thinks it probable that these waves originated in the volcanic regions of the Aleutian Islands or of western Alaska. The seismograph at the United States magnetic station, some 20 miles from Honolulu, also recorded a very distinct convulsion of the earth at about the same time. Dr. Bishop adds that both Mauna Loa and Kilauea are now in great and increasing activity. These volcanoes are about 190 miles distant from Honolulu in a direct line, where their severest convulsions are only slightly felt, although once in many years their smoke slightly obscures the atmosphere at Honolulu. Kilauea is 25 miles east of Mauna Loa, and about 4000 feet high, while the latter is 14,000.

Is it not plausible that the oceanic wave reaching the northern coasts of the Hawaiian Islands originated in some slight disturbance at the bottom of the ocean near these islands, rather than in some greater disturbance on the Aleutian or Alaskan coasts?

LOWEST TEMPERATURE AT FRANKLINVILLE, N. Y.

Dr. John W. Kales, Voluntary Observer at Franklinville, N. Y., reports that on the morning of January 5 his thermometers and thermograph registered —34° at 6 a. m., being the lowest ever recorded at that station.

METEOR AT MARION, IND.

Mr. William T. Blythe, Section Director, Indianapolis, Ind., suggests that we put on record an observation of the great meteor, the largest and most brilliant ever witnessed in the neighborhood of Marion, Ind. It was seen on the morning of November 6, 1903, at exactly 20 minutes after 5 (we assume that this means 5 hours and 20 minutes central time, or 6 hours and 20 minutes Washington time, but we are not in-